

**COMPARATIVE STUDY OF CORNEAL ASTIGMATISM IN CATARACT
SURGERY USING DIFFERENT SUTURE MATERIALS
(SILK, NYLON AND VICRYL)**

THESIS
For
MASTER OF SURGERY
(OPHTHALMOLOGY)



BUNDELKHAND UNIVERSITY
JHANSI (U. P.)

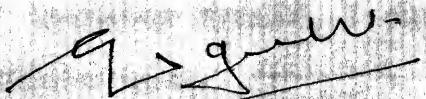
C E R T I F I C A T E

This is to certify that the work entitled "COMPARATIVE STUDY OF CORNEAL ASTIGMATISM IN CATARACT SURGERY USING DIFFERENT SUTURE MATERIALS (SILK, NYLON, VICRYL)" which is being submitted as a thesis for M.S. (Ophthalmology) has been carried out by Dr. HARISH CHANDRA in the department of Ophthalmology under our direct supervision and guidance.

The techniques and methods described were performed by the candidate himself and the observations have been periodically checked by us.

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11/10/92
Date:

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INTRODUCTION

The term navigation is used in a very general sense, and mainly to denote the movement of a vessel from one point to another, whether by land or water, and the various operations connected with the same.

There are many cases which require navigation, such as the extraction of a vessel from a narrow channel, or the movement of a vessel from one point to another.

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The first part of the book is devoted to the study of the various operations connected with navigation, and the second part to the study of the various operations connected with navigation.

INTRODUCTION

INTRODUCTION

The term astigmatism is a refractive error due mainly to an anatomic abnormality of the cornea. Astigmatism results when the cornea is not a perfect sphere because the radii of curvature in different meridians of cornea are not equal.

Incision location, suture material and suturing technique influence the development and amount of post-operative corneal astigmatism.

There are many causes which produce astigmatism such as cataract extraction through limbal incision. It is one of the very important cause after cataract extraction. The limbal wound is closed with the help of sutures and there are many types of sutures such as absorbable and nonabsorbable. Further there are many sub types of absorbable and nonabsorbable sutures. For example Silk, Nylon (monofilament) and Vicryl.

According to Jaffe and Clayman wound gape occurring with absorbable suture and nonabsorbable sutures are the primary factors which are responsible for the changing with curvature of cornea after cataract extraction. In further studies many other factors has been proposed to be responsible for the changes of the corneal curvature.

Material and methods used in suturing such as size of section, shape of section and type of section. Further the amount of astigmatism depends upon the nature of the suture material used. In the present study we have used non-absorbable sutures such as silk and nylon (monofilament) as well as absorbable suture such as vicryl.

Sutures were introduced by Henry W. Williams (1867) of New England who first inserted a single corneoscleral suture and later (1869) conjunctival sutures.

SILK SUTURE:- It is the oldest nonabsorbable suture material. Silk incites a mild leukocytic tissue reaction. Since silk is not inert it may produce corneal vascularization after many months, requiring suture removal. Spontaneous extrusion also occurs. Silk suture eventually disappear, although silk is termed nonabsorbable suture, is biodegradable over extended periods of time. Biodegradation has been observed in the form of a reduction in the number of silk filaments, decreased suture diameter and fragmentation with extrusion. Because silk sutures are typically placed in the midstroma, they may produce "against the rule" astigmatism by mechanism similar to that for absorbable sutures usually, silk sutures loosen and extrude spontaneously. However, severe inflammatory reactions have been reported that were associated with high "against the rule" astigmatism following wound dehiscence. Silk is supplied in both virgin and nonvirgin forms.

NYLON (MONOFILAMENTS) SUTURE:- Nylon (monofilament) is uniformly strong and has no tissue drag. It has an average of 20% elasticity. Elasticity provides good wound apposition under all conditions such as tissue edema forms and subsides. It is, in a self adjusting suture. The stability of the suture permits accurate refraction early in the postoperative period.

Over a prolonged period of time it may induce corneal vascularization and an exposed knot can cause a follicular reaction in the upper eyelid. This suture has the advantages of effecting excellent wound closure when appropriately placed and producing a minimal inflammatory response. The nylon (monofilament) is also extremely well tolerated by the patient.

VICRYL SUTURE:- The use of vicryl suture in cataract surgery was demonstrated by Blaydes (1975) is prepared from a copolymer of glycolide and lactide which are derived from glycolic acid and lactic acid. It is absorbable suture. The principal advantage of this suture is that they never have to be removed. It is a synthetic absorbable suture developed to obtain greater thread uniformity and to decrease allergic reaction. Absorption time of these sutures varies from 33 to 56 days. The absorption of suture can be prolonged by covering them with conjunctiva. Synthetic absorbable sutures are increased strength and reduced antigenicity when compared to catgut or collagen sutures, both of which are naturally occurring animal proteins. A potential disadvantage of absorbable suture is that they absorb more quickly when there is marked postoperative inflammation. A propensity for adherence to tissue and stiffness. In an effort to eliminate or minimize one of these deficiencies, namely tissue drag, vicryl suture was manufactured with the addition of a coating material.

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REVIEW OF LITERATURE

REVIEW OF LITERATURE

It is now possible and desirable for the ophthalmic surgeons to control postoperative astigmatism as a normal refinement in the daily routine of cataract extraction. Postoperative astigmatism can result from the malposition of the edges of the incision at the time of operation or during the healing period. Slight misalignment of the wound usually does not lead to immediate postoperative complication such as flat anterior chamber but misalignment can change the corneal curvature with the resultant astigmatism jeopardizing the postoperative visual acuity similarly mild separation of the wound after removal of sutures does not always lead to severe complication's or even may not be detected but it can change the refractive power of the cornea.

Postoperative astigmatism results primarily from deformation of the cornea by surgery. Corneal astigmatism can be defined as a condition in which incident light rays are not refracted equally in all meridians. Thus the refractive power of the eye varies with orientation of the light rays. Usually axis of greatest and least refractive power can be determined.

These are called the principal or major meridians. Astigmatism is said to be regular if the principal meridians are approximately 90° apart and irregular if they are not after a surgical procedure the principal meridians may have any axial orientation although certain operation's such as cataract surgery, often induce astigmatism with characteristic orientation.

The terms "suture induced" and "surgically induced" are frequently applied to studies on astigmatism. Suture induced astigmatism is the difference in astigmatism between the preoperative measurement and postoperative measurement with the suture still in place. Its magnitude and variation with time may be significant because of varying suture tension, differences in suture materials and other factors. Surgically induced astigmatism is the difference between preoperative and postoperative values after all suturs have been released or removed suture induced astigmatism arises from suture tension, tissues edema and the underlying surgically induced astigmatism. Surgically induced astigmatism arises primarily from incision its realignment and wound healing.

Donders F.C. (1864) first showed that an unwelcome consequence of cataract surgery is an alteration in corneal curvature. He reported against the rule astigmatism following cataract surgery.

Van Reuss and Woinow (1869) measured the astigmatism after cataract extraction with keratometer studies on corneal astigmatism related to intracapsular cataract surgery have been numerous. The older surgical techniques started without sutures at the turn of the century. Both these and later techniques employing one or two large gut sutures caused a predominance of astigmatism against the rule.

There are widely disparate view on the causes and correction of postoperative astigmatism they relate mainly to the methods of incision and closure and the effects on corneal curvature. Here is controversy over the incision size and location, the depth of sutures, the material, and the technique of suturing.

Lans L.J. (1898), Weber A. (1900) A classical cataract section usually cause a fairly regular astigmatism "against the rule". The nearer the wound to the centre of the cornea, the greater the astigmatism the effect of nonperforating wounds an astigmatism was studied.

Reutler (1900) reported a shift to "against the rule" astigmatism in 83% of patients undergoing cataract surgery and found a mean postoperative astigmatism of 0.7D. Cataract surgery has under gone many changes although in some respects

the basic operation has remained the same since the nineteenth century.

Sprati (1928), OR Wolfe and Mcleod (1932) Ellet1 (1937) J.M. Mclean (1940), Hughes and Owens (1945) D.P. Bell (1949) Hudson (1951), Pape (1967) and many others have been suggested innumerable number of sutures of different type and complexity. They may be conjuctival, corneal, conjuctivoscleral, corneo-scleral. To a certain extent the individual type used depends on the incision employed but at least one corneo-scleral suture is advisable which is preferably inserted before the incision is made to avoid malignant and subsequent distortion of the wound and unnecessary manipulation of the globe after the eye has been opened at least a post sectional suture should be introduced through a track macked before the corneal and sclera have been separated.

Catgut was first used in cataract surgery by Hughes in 1941.

Fischer F.P. (1948) preoperatively 537 of the patient has astigmatism "against the rule" i.e. the meridian of maximum power was horizontal and most of the patient were elderly. This is in accord with the senile changes in corneal astigmatism.

Dunnington (1951) and Dunnington J.H. and Regan E.F. (1952) conducted a series of experiments on corneal wound closure useing 6-0 chromic catgut or braided silk. They found that more deeply placed sutures of that material and diameter lead to

necrosis of tissue within the bite excessive formation of vascular fibroblastic tissue and rapid epithelialization of the suture tract.

Floyd G. (1951) Gills J.P. (1974) changes attributable to the suture material have been observed as has a rotation in the axis of astigmatism.

Dunnington J.H. (1957) and Eve F.R., Trautman R.C. (1976) studies on the placement of sutures used in corneal incisions have shown that it is advantage on to place silk sutures of mid stromal level, as more deeply placed sutures can lead to necrosis of the tissue and proliferation of epithelium along the suture tract.

Krish R.E. (1964) performed postoperative Schiotz tonometry and found that a transient rise in intraocular pressure may occur with the greatest rise usually on postoperative days 2nd to 5th and of average duration 7 days. Such rise of IOP can reasonably be expected to interfere with wound opposition, the further showed that the healing problem occur 3 times more frequently in cases where L-Chymotrypsin is used.

Hiff C.F., Khodadoust (1967) in their study on the control of astigmatism cataract surgery stressed attention on the distance of the section from the limbus.

Hiff C.E., Khodadoust A (1967), the position of section, changes the astigmatism.

Flaxel J.T., Swan K.C. (1969) flaxel and swans histological examination human postmortem material has documented that, after cataract extraction limbal wounds under limbal based flaps heal by in growth of the subepithelial connective tissue between stromal wound edges, this in growth begin by 5th day and is completes, in that, it extends through the entire thickness of wound about 15 days after surgery though the limbal wound is still week. This is the fact that the first signs of stability of the corneal curvature is the sample, was demonstrated at 2 postoperative may result from the condition of this ingrowth.

Kelman C.D. (1969) (1970 (1973) and Shock J.P. (1972) the result of phacoemulcification show that within one month of surgery the mean induced astigmatism is less than 0.5D.

McPherson S.D., Crawford R. Moose L., Michels R. (1970) when L-Chymotrypsin is used the tensile strength of silk is reduced to 20-25% between the second and forteenth days.

Poorce J.L. (1970) compared postoperative astigmatism with the use of different suture material indicating that there is reduction in astigmatism from with silk to 0.9D with nylon (monofilament).

Lamecke (1971), Boke (1971), Troutman (1973) has given the amount of astigmatism caused by continuous nylon sutures.

Troutman R.C. (1972) use of ^a160° corneal incision and use of 10.0 nylon suture through the full thickness of the wound apparently gives similar optical results.

Jaffe (1972) the use of absorbable sutures in surgery is documented as early as 2000 BC but not until 1943 was their use in cataract surgery first reported Hughes 1943. Today over 50% of all cataract procedures are closed with absorbable suture.

Absorbable sutures offer several advantages over their nonabsorbable counter parts.

1. Eliminate the need for removal that frequently accompanies the use of silk and nylon.
2. Do not require the exact suture tensioning of nylon.
3. Give more predictable results in the hands of most surgeons.

Treutman R.C. (1973) there may be complications of correction of astigmatism by keratotomy.

Wyman C.J. (1974) similar results are made.

Helveston and Meyers (1974) reaction and subsequent absorption are not always uniform in suture.

Chandler L.W., Sugar J., Gasset A.R. (1974) the use of 10-0 monofilament nylon suture has gained popularity among cataract and corneal transplant. This suture has the advantages of effecting excellent wound closure when appropriately placed and producing a minimal inflammatory response.

Blaydes (1974) the absorbable suture in cataract surgery should meet exacting standards. It must possess high tensile strength, adequate wound tensile, strength retention, good knot security, a predictable absorption rate and excellent handling qualities. At the same time it must provoke minimal tissue reaction.

Blaydes (1975) three general factors are considered in suture selection (1) Patient (2) Surgeon and surgical technique (3) Suture manufacture.

Jaffe and Clayman (1975) wound gape occurring with absorbable suture and wound compression occurring nonabsorbable suture have been proposed by Jaffe and Clayman. They were the first to report exact quantitative differences between pre and post operative corneal curvature.

Singh D., Kumar K. (1976) and Rowan P.J. (1976) in there study Keratometric changes after cataract extraction and corneal astigmatism following cataract extraction stressed on the number of suturs applion while cataract surgery and then effect on astigmatism.

Sall D.B. (1976) give the incidence of above between 50% and 60%.

Hydell, Maumence A.E. (1976) have pointed out that with boollace closure, if longer bites than necessary are taken considerably more tissue in subjected to compression by the suture.

Hyde L.L (1976) suggests that if more filament is used and wound gape is allowed to occur during suturing, scar formation will develop and increase the circumference of the globe this flatterring the cornea in the median perpendicular to the section.

Jaffe N.S. (1976) there is evidence that more peripheral the section the less effect there is on surgically induced astigmatism.

Asthoose T.N. Matlaga B.F. Wykoff M.H. (1977) in their study on comparative tissue response to six suture materials and rabbit corneal sclera and ocular muscle, he found that the biodegradation of silk does occur.

Lontz M.H. Linng stone D.G. (1977) in their study of astigmatism in cataract surgery.

Lentz M.H. et al (1977) in their study of astigmatism in cataract surgery reported about the change to against the rule astigmatism associated with extrusion of 8% silk.

Troutman R.C., Kelly S., Kay D., Clahane A.C. (1977), Cravy T.V. (1979) attempts to minimise postoperative astigmatism by using modified surgical techniques or the use of measuring devices to determine the amount of astigmatism induced on the operating table by the sutures.

Meredith T.A., Movmence A.E. (1979), J. Gibson Moore (1977) in his study on incidence of astigmatism and interrupted suture.

Rowan P.J. (1978), in his study, he claimed the effect of number of suture on astigmatism.

Roethkoff L., Biedner B., Blumenthal M. (1978) would argue that all chronic simple glaucoma patients should have their cataract removal through a corneal section.

Grand L.J. (1979) perform cataract extraction using parsplana lensectomy and vitrectomy by ultrasonic fragmentation that requires no limbal incision. We use a scleral tunnel to enter the anterior chamber it minimizes the severity of post-operative astigmatism.

Jhygesen J., Reersted P., Fledelius H., Corydon L. in study of corneal astigmatism after cataract extraction they paid attention on the number of sutures applied as well as in comparing the corneal and cornoscleral incision.

The eye who has a corneal section were much quite than the limbal section postoperatively.

Fyadorov (1980) reintroduced methods of keratotomy and has described its use in the correction of astigmatism.

Colvard D.M., Kratz R.P., Mazzecco T.R. Davidson B.(1980) (1981) and Terry C., Schacher R.A., Levy N.S., Schacher L., Denison, Texas Lal (1980) describing the use of the terry keratometer however the cost complexity and difficulty in using this system has prevented more universal acceptance.

An attempt was made to develop a new type of instrument to determine intraoperative astigmatism and set up the wound so that the natural wound slippage would return the corneal to a near perfect shape.

Moore J.G. (1980), postoperative astigmatism depend on decentration of lens implant.

Joseph L. Dowling Jr (1981) use absorbable and non-absorbable suture for cataract extractions with wound closure utilizing interrupted sutures.

Roper Hall M.J. (1982) High astigmatic error are amenable to the selective removal of over tight sutures and the adjustment of a continuous suture or both.

However in a number of cases of astigmatism these methods can not be applied. There are several possible reasons.

- 1- All the sutures have already been removed.
- 2- The wrong sutures have been removed making the astigmatism worse.
- 3- The sutures are buried as in a standard corneoscleral section under a limbal based conjunctival flap.
- 4- Adjustment of a continuous suture has failed.

Roper Hall M.J. (1982) most postoperative astigmatism is due to inaccurate wound closure. Adjustment of a continuous suture or removal of one or more selected interrupted suture and during the early postoperative weeks can all on a refined control.

Henkind P., Walsh J.B., Beoger A.W. (1982) they classified the silk on an nonabsorbable suture and the 8/0 diameter suture usual in this study, were not intended to be removed.

Stainer G.A., Binder P.S. et al (1982) the relation of astigmatism following removal of monofilament suture was reported and that the appropriate choice of suture material against the astigmatism, if the astigmatism is caused by

helps, the surgeon to control postoperative corneal astigmatism.

Torchia R.T., McCarthy, R.W. (1983) expressed need on prevention of side ways shift of the wound.

Vau Jej G., Waring G.O. (1984), if the section is closed tightly, it stretches the cornea vertically increasing the curvature in the ventical meridian and causing astigmatism with the rule.

Jolson A.S., Scidl F.J. (1984), postoperative astigmatism induced by intraocular lens tilt.

Reading V.M. (1984) among the subjects of attention in this respect has been the length of the section.

Terry C.M. and Binder P.S., Ear P.K. (1984) they stressed the need and value of operation keratometer.

Soong H.K. Kenyon K.R. (1984) adverse reaction to silk has been reported by Soong and Kenyon who suggest that immunological reaction, mounted against the sericen gum of the silk may occur.

Louis J. Girard, Jorge Rodriguez and Mary L. Mailman (1984) the type of incision is an important factor in induced astigmatism after cataract extraction despite variations in the type of suture and the technique of suturing.

Amoils S.P. (1985), if the incision is approximated too loosely, there is gaping of the wound edges. This causes a flatterring of the cornea. Vertically, and results in an against the rule astigmatism. If the incision is closed too

tightly, there is compression of the wound. This causing steepening of the cornea vertically and results in a with the rule astigmatism.

Atkins A.D., Rooper Hall M.J. (1985) shows that postoperative astigmatism can be controled in corneal section cases.

Some surgeons have avoided corneal sections because of unacceptable and unpredictable postoperative astigmatism. Apart from this aspect the corneal section has considerable advantages. The major objections to the corneal section are shower healing and increased astigmatism.

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MATERIAL AND METHODS

1. *Paramecium aurelia*

2. *Paramecium*

MATERIAL AND METHODS

In the present study "corneal astigmatism in cataract surgery comparative study using silk, nylon and vicryl sutures".

120 cataract patients were selected from the eye O.P.D., M.l.b. Medical College, Hospital Jhansi.

The patients were divided into three groups.

1. Group A - Consisting of 40 patients. In this group silk suture was used as suturing material.
2. Group B - Consisting of 40 patients. In this group nylon (monofilament) suture was used as suturing material.
3. Group C - Consisting of 40 patients. In this group vicryl suture was used as suturing material.

The patients were examined under following headings:

1. Name
2. Age/Sex
3. Occupation
4. Address
5. Personal History
6. Past History

GENERAL EXAMINATION- (1) Anaemia (2) Oedema (3) Pulse rate (4) Blood pressure (5) Temperature (6) Lymph node.

SYSTEMIC EXAMINATION- (1) CVS (2) CNS (3) Respiratory.

LOCAL EXAMINATION- (1) Face (2) Eye lids (3) Eye lash (4) Conjunctiva (5) Cornea (6) Anterior chamber (7) Iris (8) Lens (9) Vision and PL, PR (10) Lacrimal apparatus.

INVESTIGATIONS- 1- Blood - Hb%, TLC, DLC, ESR, Sugar $\begin{matrix} \text{F} \\ \text{PP} \end{matrix}$

2- Urine - Albumin, Sugar, Microscopic.

For the extraction of the cataractus lens small limbus based conjuctival flap was made and midlimbal incision was given extending approximately from 9 'O' clock to 3 'O' clock position.

The section was cut vertically downward with a razor blade fragment and completed with corneo-scleral or spring scissors. One post placed central suture was given then cataract was extracted by both extra-capsular as well as intra-capsular.

After cataract extraction, section was closed with the help of suture in interrupted manner. The number of stitches were 5-7 in each case and the depth of the suture placement was at about the middle third of the incision. The surgery was performed by one surgeon.

Corneal astigmatism was measured by an observer not involved in the surgery and without prior knowledge of the type of surgery. The suture was removed after 10 days in cases of nonabsorbable suture.

ASTIGMATISM

S.No.	Groups	No.of patients	Period		Remark
			Preoperative	Postoperative	
1	A				
2	B				
3	C				

XXXXXXXXXXXXXXXXXXXXXXXXXXXX

OBSERVATION

OBSERVATION

Corneal astigmatism has been estimated preoperatively in all the patients of group 'A', 'B' and 'C' respectively. After cataract extraction corneal astigmatism has also been studied in all the patients of the group 'A', 'B' and 'C' postoperatively. Finally the postoperative corneal astigmatism in all the three groups were compared from the preoperative astigmatism.

In group 'A' most of cases of mature cataract of senile type among which 33 cases were of mature cataract, 6 cases sub-mature cataract and one case was traumatic cataract.

In group 'B' 35 cases were of mature cataract and 5 cases were of sub-mature cataract. While in group 'C' all the 40 cases were of mature cataract of senile type. The details of the cases selected in all the three groups are given below in the table no. I.

Table I
SHOWING DETAILS OF THE CASES SELECTED

S.No.	Type of cataract	group A	group B	group C
1.	Mature cataract	33	35	40
2.	Submature cataract	06	05	00
3.	Traumatic cataract	01	00	00
Total		40	40	40

Table II
SHOWING THE AGE AND SEX DISTRIBUTION

S.No.	Age group	Sex				Total cases	
		Male		Female			
		No.	%	No.	%	No.	%
1.	00-10	-	-	-	-	-	-
2.	11-20	-	-	-	-	-	-
3.	21-30	01	0.86	-	-	01	0.86
4.	31-40	03	2.58	02	1.72	05	4.30
5.	41-50	01	0.86	-	-	01	0.86
6.	51-60	14	11.66	06	5.00	20	16.66
7.	61-70	40	33.33	36	30.00	76	63.33
8.	71-80	13	10.83	04	3.33	17	14.16
Total	-	72		48		120	

In our series, maximum cases were belonging to rural area (70%), while patients of urban area were less in number as shown in table III.

Table IIISHOWING RURAL AND URBAN DISTRIBUTION OF THE PATIENTS

S.No.	Resident of Urban/Rural	No.of cases	Percentage
1.	Rural	84	70%
2.	Urban	36	30%

In our observation, the preoperative astigmatism was measured in each group which is described below in table IV.

Table IVSHOWING PREOPERATIVE ASTIGMATISM

S.No.	Amount of astigmatism in Diopter	Group A	Group B	Group C
1.	0.0	5	6	3
2.	0.25	4	2	8
3.	0.50	5	8	4
4.	0.75	7	8	4
5.	1.00	8	6	5
6.	1.25	4	3	4
7.	1.50	3	2	4
8.	1.75	1	3	3
9.	2.00	2	2	3
10.	2.25	1	0	2
11.	2.50	-	-	2
12.	2.75	-	-	3
13.	3.00	-	-	-
14.	3.25	-	-	-
15.	3.50	-	-	-
16.	3.75	-	-	-
17.	4.00	-	-	-
Total		40	40	40

All the patients underwent preoperatively and postoperatively upto 3 months.

The amount of postoperative astigmatism was substantially and significantly less in 'A' and 'B' group rather than group 'C' which is shown in table V.

Table V
SHOWING AMOUNT OF POSTOPERATIVE ASTIGMATISM

S.No.	Amount of astigmatism in Diopter	Group A	Group B	Group C
1.	0.00	3	2	0
2.	0.25	2	2	0
3.	0.50	7	8	0
4.	0.75	6	8	3
5.	1.00	6	7	2
6.	1.25	7	8	3
7.	1.50	4	3	3
8.	1.75	2	1	3
9.	2.00	2	1	3
10.	2.25	1	0	3
11.	2.50	0	0	3
12.	2.75	-	-	2
13.	3.00	-	-	3
14.	3.25	-	-	1
15.	3.50	-	-	2
16.	3.75	-	-	0
17.	4.00	-	-	1
<u>Total</u>		<u>40</u>	<u>40</u>	<u>40</u>

Table VISHOWING COMPARATIVE STUDY OF PREOPERATIVE AND POSTOPERATIVE ASTIGMATISM

S.No.	Amount of astigmatism in Diopter	Group A		Group B		Group C	
		Pre-operative	Post-operative	Pre-operative	Post-operative	Pre-operative	Post-operative
1.	0.00	5	3	6	2	3	0
2.	0.25	4	2	2	2	8	0
3.	0.50	5	7	8	8	4	0
4.	0.75	7	6	8	8	4	3
5.	1.00	8	6	6	8	4	3
6.	1.25	4	7	3	8	4	3
7.	1.50	3	4	2	3	4	3
8.	1.75	1	2	3	1	3	5
9.	2.00	2	2	0	1	3	5
10.	2.25	1	1	-	0	2	5
11.	2.50	-	-	-	0	3	5
12.	2.75	-	-	-	0	-	2
13.	3.00	-	-	-	-	-	3
14.	3.25	-	-	-	-	-	1
15.	3.50	-	-	-	-	-	2
16.	3.75	-	-	-	-	-	0
17.	4.00	-	-	-	-	-	1

Comparative analysis of mean values in different groups are given below in table VII.

Table VIISHOWING MEAN VALUES IN DIFFERENT GROUPS

S.No.	Groups	Mean Value	
		Preoperative	Postoperative
1.	A	0.806	0.963
2.	B	0.85	1.162
3.	C	1.106	2.112

As shown in the above table in group 'A' cases the postoperative astigmatism varies between 0.25D to 2.25D and the mean value of the astigmatism in this group was found to be 0.96D.

In group B cases the variation of postoperative astigmatism was between 0.25 to 2.0D and the mean values of astigmatism was 1.162D.

While in group C cases the variation of post-operative astigmatism was between 0.75 to 4.0D and the mean value of the astigmatism in this group was 2.112D.

Table VIII
SHOWING AXIS OF POSTOPERATIVE ASTIGMATISM

S.No.	Cylinder axis	Group A	Group B	Group C
1.	60°-120°	12	14	39
2.	20°-160°	28	26	01
Total		40	40	40

The axis of astigmatism was "against the rule" in only one third of the patients in group 'A' and 'B' and 95% patients were found in group 'C' on the other hand approximately two third patients were found 'with the rule' astigmatism in group 'A' and 'B'. In group 'C' only one patient was found in this axis.

8 patients were identified who had undergone bilateral cataract surgery with nonabsorbable suture such as with silk in one eye and absorbable suture such as vicryl in the other. The striking pattern of differences in wound healing characteristics demonstrated in the entire series was clearly confirmed in this smaller group of paired eyes in table IX.

Table IX

S.No.	Suture	Amount of astigmatism (Mean)	Against the rule	With the rule
1.	Silk	0.96D	4	4
2.	Vicryl	2.11D	7	1

Where a change of axis occurred the results are surprising because in group 'A' the change in axis when it did occur was from "with the rule" to "against the rule" (11 cases out of 40). But in the group 'B' the change was occur from "against the rule" to "with the rule" (15 cases out of 40). In group 'C' the change was the same as it occur in group 'A' (6 cases out of 40).

Table X

S.No.	Group	No. of patients	Change	No. of patient in which change occur
1.	A	40	"With the rule" to "against the rule"	11
2.	B	40	"Against the rule" to "with the rule"	15
3.	C	40	"With the rule" to "against the rule"	06

Table XITYPE OF PREOPERATIVE ASTIGMATISM

S.No.	Type of astigmatism	No. of patient	Per-centage	Mean
1.	With the rule	38	32	1.10D
2.	Against the rule	65	54	0.83D
3.	Spherical cornea	17	14	-

In preoperative astigmatism 32% patients were found "with the rule" astigmatism and 54% patients were observed "against the rule" astigmatism while in 14% cases spherical cornea was appeared.

The incidence of complication in each group was comparable in table XII.

Table XII
SHOWING COMPLICATION

S.No.	Complication	Group A	Group B	Group C
1.	Vitreous loss	0	2	0
2.	E C L E	2	0	2
3.	Hyphema	5	6	3
4.	Retinal Detachment	1	0	0
5.	Corneal edema	0	0	1
6.	Cystoid macular edema	0	1	0
Total		8	9	6

Various types of complications which are described in above table was seen in 23 cases out of 120.

The comparative final visual acuities were described in table XIII.

Table XIII
SHOWING FINAL VISUAL ACUITY

S.No.	Visual Acuity	Group A	Group B	Group C
1.	20/15	3	3	3
2.	20/20	26	25	19
3.	20/25	7	8	12
4.	20/30	3	3	5
5.	20/40	-	-	-
6.	20/40	1	1	1

The overall out come in these 120 patients was quite satisfactory and comparable between the three groups. One hundred seventeen of the patients achieved a final visual acuity of 20/40 or better. The three patients with less than 20/40 were post-operative retinal detachment (20/50) in group 'A', One corneal edema (20/70) in the group 'C' and one unresolved cystoid macular edema (20/70) in group 'B'.

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DISCUSSION

DISCUSSION

The present study comprises of 120 cases were studied for corneal astigmatism in cataract surgery. The effect of suture material in corneal astigmatism were included in the present study. Cases were selected from the patients attending Ophthalmology Out Patient Department during the period from 1st December 1990 to 31st December 1991.

Diagnosis of cataract was made on the basis of history and clinical examination supplemented with relevant investigations. Most of the patients in which cataract surgery was planned had senile cataract (110 cases were of mature cataract and 9 cases were of sub mature cataract excepting one case who had traumatic cataract.

Cataract operation was performed by intra-capsular lens extraction (ICLE) techniques excluding one patient of traumatic cataract in which extra-capsular (ECLE) was done.

Cases were divided on the basis of choice of suture material used into three groups 'A', 'B' and 'C' consisting of 40 patients in each group.

In group 'A' patients, silk suture was used and in group 'B' patients nylon (monofilament) suture was used while in group 'C' patients absorbable suture vicryl was used.

After lens extraction postoperative corneal astigmatism was observed.

Follow up of the patients was done and then the postoperative corneal astigmatism was compared in all the three groups and this corneal astigmatism was also compared with the results of the other workers. The details of which given below.

In the present study in group 'A' cases there were 3 cases in which postoperative astigmatism was not observed maximum cases were having postoperative astigmatism between 0.50D to 1.25D. The mean postoperative astigmatism in this group was found to be 0.963D (while preoperative mean value of astigmatism in this group was 0.806D). The mean value of postoperative astigmatism 0.963D.

The mean value in this present study is quite near to the mean value of postoperative astigmatism of 1D produced by silk sutures after 2 months of follow up. Studied by Belmont S.C., Troutman R.C. (1985).

In group B cases in 2 cases postoperative astigmatism was not found. Here again the maximum cases were having postoperative astigmatism between 0.50 to 1.25D. This value 0.50 to 1.25 is exactly similar to the findings of Dowling J.L. (1981) which was peaked between 0.50 to 1.25D in his study.

The mean postoperative astigmatism was found to be 1.162D (Mean preoperative astigmatism was 0.85D). This value 1.162D, although slightly higher, is comparable to the mean value of 1.03D which was found by Dowling J.L. 1981.

In group 'C' cases every case were found to have postoperative astigmatism and their values varies between 0.75D to 4.0D. This is comparable to the values obtained by Dowling J.L. (1981) in his study which was between 0.25 to 4.0D. Maximum cases were having postoperative astigmatism between 1.75D to 2.50D which is exactly similar to the values obtained by Dowling J.L. (1981).

The mean value in our study was found 2.112D which is almost similar and comparable, to the mean value of postoperative astigmatism observed by Dowling J.L. (1981) in his study of 100 cases which was 2.14D.

The degree of astigmatism remained constant until the suture was removed, its magnitude being in direct proportion to the tightness of the suture. The suture should be tightened only enough to approximate the wound edges. The fact that suture induced astigmatism remained constant meant that patients could be fitted with a cataract spectacle 2 weeks after surgery that tided them over the 3 to 4 months postoperatively until the suture was removed.

Once the suture was removed the astigmatism dropped significantly within 4 weeks and the final postoperative astigmatism was not significantly changed from the preoperative value. In 46% of eyes the pre and postoperative corneal astigmatism were the same and in 78% the change was equal to or less than 0.75 dioptres.

This was very near to the findings of Maurice H. Hintz and Desiree G. Livingston (1977) who reported in 48% of eyes the pre and postoperative astigmatism

were the same and in 80% the changes was equal to or less than .75 dioptres.

In 40% of eyes the axis was displaced obliquely probably the result of a tendency to tilt the incision to the right side.

The preponderance in this study of "with the rule" astigmatism following cataract surgery and of oblique astigmatism, the flat meridian moved vertically, which can be explained by an obliquely placed incision.

This confirms the findings of an earlier investigation (Bedrossian et al, 1969), we compared the postoperative corneal astigmatism closed by interrupted 8/0 silk, interrupted 8/0 nylon (monofilament) we find that there is no significant difference Hutz and Livingston (1976) was reported the results.

Luntz in his study found that postoperative astigmatism consists of suture induced astigmatism and operative astigmatism further suture induced astigmatism is not a problem in cases of silk sutures because silk sutures get necrosed and extruded and absorbable get absorbed only in cases of nylon sutures which do not get extruded.

The unique characteristics of nonabsorbable suture which distinguish it from absorbable suture material are inertness and elasticity. The healing process with absorbable suture is characterized by inflammation and necrosis around the sutures with resultant fistulization and track epithelialization. For this reason absorbable sutures can not be placed deeper than the central third of the incision therefore, the margins of the inner third of the incision are not opposed. The inertness of nylon permits these sutures to be placed through the entire depth of the incision which results in apposition of the entire wound margin nylon can even be placed through and through into the anterior chamber as advocated by Troutman (1974) with no adverse effect. This type of suturing may cause more endothelial cell loss (Binder P.S. (1978) the elasticity of the nonabsorbable suture allows the sutures to stretch during the period of postoperative edema and to snug up the incision margins after subsidence of the edema. Absorbable sutures cut through during the period of swelling and may then be excessively loose in later stages of healing. The additional advantage of non-absorbable sutures is the availability of sharper and finer needles which cause less tissue trauma during

suture placement. About ten interrupted sutures are necessary for a standard cataract incision and additional sutures can and should be easily placed if inspection of the incision suggests any potential defects. The sutures must be carefully tied using either a triple overhand on the first throw followed by 2 or 3 square knots or one of the slide knot ties as described by Terry and Dangel and Keates.

An important advantage of nonabsorbable sutures is the capacity to modify excessive astigmatism.

Minimal postoperative astigmatism not only facilitates adjustment to aphakic spectacles but is even more desirable for successful aphakic contact lens fitting.

Absorbable sutures are characteristically associated with significantly larger amounts of astigmatism usually "against the rule". "Against the rule" astigmatism indicates that wound has gradually stretched and weakened. The greater the amount of astigmatism, the poorer the wound healing.

Good wound closure following cataract extraction results in fewer complications and better visual rehabilitation. This study demonstrate that nonabsorbable sutures produce better surgical wounds than do absorbable sutures as manifested by the amount of axis of astigmatism smaller incidence of wound leak complication and the internal appearance of the incisions.

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SUMMARY

SUMMARY

It is a known fact that in cataract surgery there would be astigmatism produced due to healing of section. It was estimated to be about 2-4 diopters against the rule during presuture era.

With the advent of finer suture materials of different types and sizes, degree and type of astigmatism has varied.

One hundred and twenty cases of senile cataract were operated by using silk suture, nylon (monofilament) and vicryl in Ophthalmics department of M.L.B. Medical College, Jhansi since 1st December, 1990 to 31st December, 1991.

The surgery was performed by the one surgeon and pre-operative astigmatism was calculated each of patient.

Every patient was thoroughly examined before operation in reference to any anterior segment disease of the eye.

The cataract extraction was performed via a mid limbal section of approximately 180° under a short limbus based conjunctival flap.

Both extra-capsular as well as intra-capsular cataract surgery was performed.

Corneal astigmatism was measured by an observer not involved in the surgery and without prior knowledge of the type of surgery or the surgeon involved.

It was assessed preoperatively and postoperatively after three months the suture removed after 10 days in cases of nonabsorbable suture.

Sutures were introduced by Henry W. Willams (1867) who first inserted a single corneoscleral suture and later (1869) conjunctival sutures.

Jaffe and Clayman (1975) wound gape occurring with absorbable suture and wound compression occurring with non-absorbable suture have been proposed. They were the first to report exact quantitative differences between preoperative and postoperative corneal curvature.

Each patient included in this study was between the ages of 20 to 80 and had a minimum of three months follow up.

The incidence of complication in each group was compared. Hyphema was found more in nonabsorbable suture than absorbable suture.

Visual acuity was found better in nonabsorbable suture than absorbable suture.

The amount of astigmatism was substantially and significantly less in the silk and nylon group rather than vicryl. These observations are based on refraction and consider preoperative astigmatism.

The axis of astigmatism was against the rule in 95% of the vicryl suture patients in this study. Only one third of the astigmatism in the nylon group and silk group was at this axis.

The difference of pre and postoperative astigmatism by refraction was appeared to give best result in virgin silk a change of axis occurred the results are surprising because with vicryl suture the change in axis when it did occur was from "with the rule" to "against the rule" using virgin silk sutures it was also from "with the rule" to "against the rule". But in the nylon suture the change was occur from "against the rule" to "with th rule".

The results of present series were compared with the findings of other workers in the field of astigmatism during cataract surgery. Thus it may be advocated that corneal astigmatism in cataract surgery depend on suture material used.

Thus based on present study, it is finally concluded that the postoperative astigmatism is found minimum in silk suture than in nylon (monofilament) and vicryl.

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\*\*\*\*\*  
CONCLUSION  
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## CONCLUSION

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The following conclusions were drawn from the present study.

1. The postoperative astigmatism was found minimum in silk suture and maximum in vicryl suture.
2. By employing silk sutures the resultant astigmatism was against the rule.
3. By using nylon (monofilament) sutures, we got very high astigmatism with the rule after the operation.
4. Vicryl sutures was associated with significantly large amount of astigmatism usually against the rule.
5. This study was demonstrated that nonabsorbable sutures such as silk and nylon (monofilament) produced better surgical wounds than absorbable sutures such as vicryl as manifested by the amount of axis of astigmatism.

6. The astigmatism was not influenced by the suturing technique within the frame work of those used in our study.

7. Retention of sutures was associated with near constancy of SIA and ROS was associated with a dramatic reduction of power of SIA.

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